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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/717,399	11/22/2000	Won Jun Lee	041501-5411	9439

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EXAMINER

TRINH, HOA B

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 10/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/717,399

Applicant(s)

LEE

Examiner

Vikki H Trinh

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 1-5 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6, 16 and 18 is/are rejected.
- 7) ☒ Claim(s) 7-15, 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group II, claims 6-18, in Paper No. 7 is acknowledged.
2. Claims 1-5 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group I, there being no allowable generic or linking claim. The election was made **without** traverse in Paper No. 7.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:
 1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 6, 16, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chittipeddi et al. 5,972,179 in view of Kim 5,804,501.

As to claims 6, 18, Chittipeddi et al. 5,972,179 discloses forming an insulating film 14 on a semiconductor substrate 11 and selectively etching the insulating film 14 to form a contact hole 13. See Fig. 1. Chittipeddi et al. 5,972,179 discloses further discloses forming a Ti seed layer 15 by PVD (col. 3, line 40), forming a CVD-TiN thin film 16 on layer 15 (col. 3, line 51), and forming a PVD film 21 over layer 16 to fill the contact hole 13. See col. 4, lines 30-63.

Present claim 6 specifies “forming a PVD reflow thin film on the CVD thin film to fill the contact hole and form a flat thin film on the interleaving insulating film.”

However, Chittipeddi forms an additional PVD thin metal film 17 between the metal layers 16 and 21 as seen in fig. 5. The reference teaches that the dual CVD/PVD films 16/17 improves the texture of the aluminum layer 21 (col. 4, lines 50-63). Therefore, it would have been obvious to omit the PVD film 17 and deposit the aluminum film 21 on the CVD layer 16 if the texture of the layer 21 is not critical.

Further, the present claims require a barrier metal layer on the insulating film and in the contact hole (see claim 6, lines 3 and 4). Kim 5,804,501 discloses that “a thin film may be formed on barrier metal layer 23, so that the material of the thin film may react with AL of a wiring layer. This step may raise the mobility of the Al during formation of a first wiring layer, and help in the movement of Al atoms into the contact hole.” Col. 3, lines 10-17. Therefore, in

view of Kim, it would have been obvious to form a barrier metal layer on the insulating layer 14 and in the contact hole 13 prior to forming the PVD layer 15 as disclosed in Chittipeddi et al.

As to claim 16, though the combined teaching of Chittipeddi et al. 5,972,179 in view of Kim 5,804,501 does not explicitly teach a specific range of thickness for the reflow PVD thin film relative to the final thickness of the thin films, it would have been obvious since it is prima facie obvious to an artisan's optimization and experimentation to select a range of thickness because applicant has not yet established any criticality of the specific range.

Response to Amendment

As to claims 6, 16, 18, the examiner withdraws the indication of allowable subject matter in the previous action in view of the newly cited reference.

Allowable Subject Matter

Claims 7-15, 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

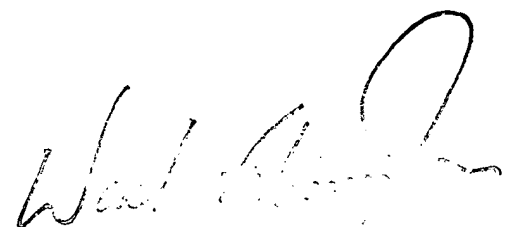
The following is an examiner's statement of reasons for allowance: The prior art of record does not disclose nor fairly suggest either in singularity or in combination a method for forming a metal thin film of a semiconductor device comprising the combination of steps of cleaning an internal portion of the contact hole and a surface interleaving insulating using plasma cleaning process; the material of the seed film, thing film, and reflow thin film are made of the same material; and other steps in the claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Vikki Trinh whose telephone number is (703) 308-8238. The Examiner can normally be reached Mon-Tuesday, Thurs-Friday, 7:30 AM - 6:00 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Wael Fahmy, can be reached at (703) 308-4918. General inquiries relating to the status of this application should be directed to the Group receptionist at (703) 308-0858. The fax number is (703) 308-2708.

Vikki Trinh,
Patent Examiner
AU 2814



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